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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/844,679	04/30/2001	Teruichi Watanabe	Q64172	8978

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WASHINGTON, DC 20037-3213

EXAMINER
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YAMNITZKY, MARIE ROSE

ART UNIT	PAPER NUMBER
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1774

DATE MAILED: 09/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/844,679

Applicant(s)

WATANABE ET AL.

Examiner

Marie R. Yamnitzky

Art Unit

1774

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

1. This Office action is in response to applicant's amendment filed June 16, 2004, which amends claim 1 and cancels claim 9.

Claims 1-8 are pending.

2. All rejections of claim 9 as set forth in the Office action mailed December 16, 2003 are rendered moot by the cancellation of claim 9.

The rejection of claims 1-8 under 35 U.S.C. 112, 1<sup>st</sup> paragraph (failure to comply with the written description requirement), is overcome by applicant's amendment.

The rejection of claims 2-4 under 35 U.S.C. 112, 1<sup>st</sup> paragraph (scope of enablement), is overcome by applicant's amendment, and the rejection of claims 1 and 5-8 on the same grounds is overcome in part by applicant's amendment. Claims 1 and 5-8 do not limit the iridium complex compound to tris(2-phenylpyridine)iridium but, upon further consideration, the examiner withdraws the portion of the rejection that indicated that enablement was only provided for devices in which the iridium complex compound is tris(2-phenylpyridine)iridium.

The rejection of claims 1-8 under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, is overcome in part by applicant's amendment. The remaining issue is set forth below.

3. Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitations imposed by the phrase “in a luminance half-life period characteristic of the organic electroluminescence element with respect to a concentration of the iridium complex compound in the light emitting layer made of the carbazole compound” as recited in claim 1 are not clear. It is not clear if/how this language further limits the requirement that the electroluminescence element “satisfy a normalized luminance half-life period of more than 3000 hours”.

4. Claims 1-3, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldo et al. in *Appl. Phys. Lett.* 75(1), pp. 4-6 (July 5, 1999) in view of Tsutsui et al. in *Jpn. J. Appl. Phys.* 38, pp. L1502-L1504 (December 15, 1999).

See the whole Baldo article.

Baldo et al. disclose an electroluminescent device comprising an anode, a layer of 4,4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl (abbreviated  $\alpha$ -NPD), a light emitting layer comprising *fac* tris(2-phenylpyridine) iridium (abbreviated Ir(ppy)<sub>3</sub>) and 4,4'-N,N'-dicarbazole-biphenyl (abbreviated CBP) wherein the concentration of Ir(ppy)<sub>3</sub> is 1% by weight, a hole blocking layer of 2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline (abbreviated (BCP), an electron transporting layer of tris(8-hydroxyquinoline) aluminum (abbreviated Alq<sub>3</sub>), and a cathode.

Ir(ppy)<sub>3</sub> is the specific iridium complex compound required by claim 2.

CBP is the specific carbazole compound required by claim 3.

The layer of  $\alpha$ -NPD in the Baldo's devices meets the limitation of a hole injecting layer as recited in claim 1.

The ionization potential relationship required by claim 8 is inherent in Baldo's devices which comprise a hole blocking layer. It is the examiner's understanding that CBP has at least a slight ability to transport electrons and therefore considers CBP to meet the limitations of an electron transport material for purposes of claim 8.

Baldo et al. do not disclose the luminance half-life period of the devices. Baldo's device having 1% Ir(ppy)<sub>3</sub> in the carbazole compound has a concentration of iridium complex compound that is very close to the lower end of the range set forth in present independent claim 1 which requires a minimum of "more than 1 wt%".

One of ordinary skill in the art at the time of the invention, having knowledge of the teachings of Tsutsui et al., would have recognized that half-life values are dependent upon factors such as the initial luminance. Fig. 3 of Tsutsui's article shows that for a single device, the lower the initial luminance used for determining half-life, the longer the half-life.

It is reasonable to expect that Baldo's device having 1% Ir(ppy)<sub>3</sub> in the carbazole compound CBP is capable of exhibiting a normalized half-life period of greater than 3000 hours when calculated with respect to initial luminance  $L_0 = 100 \text{ cd/m}^2$ . (The curve drawn to fit the data points set forth in Fig. 7 of the present application shows  $L_0 = 100$  half-life to be about 4000 hours for an Ir(ppy)<sub>3</sub> concentration of 1%.) Devices of the same structure having slightly greater than 1% Ir(ppy)<sub>3</sub> would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention because one skilled in the art at the time of the invention would have expected such devices to have properties very similar to the properties of the device having 1% Ir(ppy)<sub>3</sub>.

Tsutsui et al. also suggest that device structure can be optimized to increase device durability. For example, see the first full paragraph on page L1503 of Tsutsui's article. One of ordinary skill in the art at the time of the invention would have been motivated to optimize Baldo's devices in order to optimize device characteristics such as half-life. One of ordinary skill in the art at the time of the invention would have been motivated to optimize the device structure in order to optimize half-life because half-life affects the useful life of a device.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Baldo et al. in view of Tsutsui et al. as applied to claims 1-3, 7 and 8 above, and further in view of JP 2000-21572.

Neither the Baldo article nor the Tsutsui article discloses a device in which the carbazole compound in the light emitting layer is the carbazole compound required by claim 4. Both of these prior art references utilize the carbazole compound required by claim 3.

JP 2000-21572 discloses the carbazole compound required by claim 4 and the carbazole compound required by claim 3, and teaches that these compounds can be used in a light emitting layer of an electroluminescent device. See the abstract and see the compounds of formulae (1) and (23) (pages 7-8 of the Japanese language document).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to use other known carbazole compounds in the light emitting layer of Baldo's device. One of ordinary skill in the art would have been motivated to use other known carbazole compounds in order to provide other functional light emitting devices and, having knowledge of

JP 2000-21572, would have reasonably expected that the carbazole compound required by claim 4 could be used for the same purposes as the carbazole compound of claim 3.

6. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldo et al. in view of Tsutsui et al. as applied to claims 1-3, 7 and 8 above, and further in view of Mori et al. (US 5,281,489) or applicants' admitted prior art.

Neither the Baldo article nor the Tsutsui article discloses a device comprising separate hole injecting and hole transporting layers between the anode and the light emitting layer.

Baldo et al. do not disclose separate electron injecting and electron transporting layers between the cathode and the light emitting layer. Tsutsui et al. disclose a device which meets the limitations of the layered structure: light emitting layer, electron transporting layer, electron injecting layer, cathode although Tsutsui et al. consider the electron injecting layer to be part of a bilayered cathode.

The use of multiple layers having the functions of hole injecting and/or transporting, and the use of multiple layers having the functions of electron injecting and/or transporting is known in the art as demonstrated by the patent to Mori et al. (e.g. see column 28, line 63 - c. 29, l. 49) and as admitted by applicants (e.g. see the first paragraph in the description of the related art on page 1 of the present specification).

It would have been an obvious modification to one of ordinary skill in the art to modify Baldo's device to include additional functional layers such as hole transporting and/or injecting layers or electron transporting and/or injecting layers which are known to be useful in

electroluminescent devices as demonstrated by Mori et al. and as admitted by applicants. It would have been *prima facie* obvious to one of ordinary skill in the art to include additional functional layers in Baldo's device for the purposes for which these functional layers are conventionally provided.

7. Claims 1-8 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Hosokawa (US 2002/0045061 A1) for reasons of record in the Office action mailed December 16, 2003.

8. Applicant's arguments filed June 16, 2004 have been fully considered but they are not persuasive.

With respect to the obviousness rejections based on Baldo et al. in view of Tsutsui et al., Baldo et al. in view of Tsutsui et al. further in view of JP 2000-21572, and Baldo et al. in view of Tsutsui et al. further in view of Mori et al. (US 5,281,489) or applicant's admitted prior art, the rejections have been modified to delete comments regarding Baldo's device having 6% Ir(ppy)<sub>3</sub> since these comments were relevant only to prior claim 9, which is now cancelled. Applicant's arguments do not specifically address the examiner's position regarding the *prima facie* obviousness of devices having slightly greater than 1% Ir(ppy)<sub>3</sub> given Baldo's disclosure of a device having 1% Ir(ppy)<sub>3</sub>.

With respect to the obviousness rejection based on Hosokawa, applicant argues that it cannot be expected by one of ordinary skill in the art that a normalized half-life greater than 3000 hours at an initial luminance  $L_0=100$  is obtained even if determined at an unspecified lower



initial luminance value (i.e. lower than Hosokawa's initial luminance of  $500 \text{ cd/m}^2$ ). Applicant's arguments are not persuasive because even if one of ordinary skill would not necessarily expect a normalized half-life greater than 3000 hours at  $L_0=100$  from any of the specific devices disclosed by Hosokawa, one of ordinary skill in the art would have reasonably expected a considerable increase in normalized half-life when calculating at an initial luminance of  $100 \text{ cd/m}^2$  versus when calculating at an initial luminance of  $500 \text{ cd/m}^2$ . For example, extrapolating from Fig. 3 in the Tsutsui article, the normalized half-life of the  $\text{Ir(ppy)}_3$  device depicted in Fig. 3 more than doubles when the initial luminance is  $100 \text{ cd/m}^2$  instead of  $500 \text{ cd/m}^2$ . Although the Tsutsui article is not used in combination with the Hosokawa reference, the Tsutsui article is relevant as demonstrating the increase in half-life that one of ordinary skill in the art at the time of the invention could reasonably expect when based on a lower initial luminance.

Applicant's arguments are also not persuasive because while Hosokawa does not disclose a normalized half-life of more than 3000 hours at  $L_0=100 \text{ cd/m}^2$  as a specific goal, Hosokawa desires to increase the practical life span of an electroluminescent device and demonstrates that half-life is affected by factors other than the concentration of iridium complex. The examiner maintains the position that it would have been *prima facie* obvious to one of ordinary skill in the art to optimize device structure in order to optimize the life span of the device.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

10. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax number for Art Unit 1774 is (703) 872-9306 for all official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY  
September 13, 2004



**MARIE YAMNITZKY  
PRIMARY EXAMINER**

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